USDA Forest Service
Southern Research Station
Project Fact Sheet

SANTEE FIRE PLOTS

Effects of 40 years of Prescribed Fire on Pine Regeneration and Productivity

BENEFITS

- Reduces hazardous fuels
- Improves habitat
- Controls pests and plant diseases
- Useful for site preparation
- Enhances herbaceous vegetation

APPLICATIONS

Results will provide foresters, the scientific community, and the public at large with the knowledge for implementing sustainable prescribed fire treatment to achieve healthy forests.

They will also provide managers with a historical perspective on sustainable forest management in the southeastern U.S. and challenge our interpretations of short-term ecological studies.

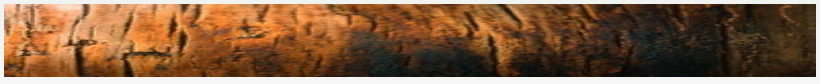
Study will ensure long-term forest stability and productivity of Coastal Plain forests

The Santee Fire Plots prescribed fire study is among the oldest ongoing forest research studies in the United States. Established in 1946, this work imparted much of the current knowledge of fire effects on vegetation community site productivity and soil fertility. The study was designed to provide a basis for sustainable prescribed fire management for Coastal Plain pine forests. Researchers examined the effects of fire frequency and season on pine growth, vegetation and soil properties. Those findings presented in numerous articles indicated that there were no deleterious effects of the treatments after 40 years of continuous fire management.

In 1989, the stand was destroyed by hurricane Hugo, effectively ending the treatments. The Santee Fire Plots were salvage-logged, burned, and uniformly regenerated following the hurricane. A pilot study was conducted in 2002 to evaluate the regeneration response. Contrary to the findings during the first 40 years of study, results showed differences in stand structure, productivity and species composition. Specifically, they suggested a second rotation decline in productivity following frequent, summer prescribed fires. Researchers are currently testing these findings more intensively. This work has implications for how researchers and managers interpret short-term studies of fire effects on forest productivity; they also demonstrate the need for long-term fire effects studies.

Aerial view of Santee Fire Plots (circa 1980).

Researchers initiated the burning regimes in 1946.



PROJECT DESCRIPTION

Current Objectives: To determine how various prescribed fire treatments affect the productivity of regenerated loblolly pine stands

The study was conducted on five, 0.25 acre replicate blocks. Treatment included a full-factorial of winter and summer versus periodic (3-5 years) and annual fires. Vegetation was measured for crown cover, stem density and abundance, and basal area, among other things. Soils and the forest floor were considered with respect to organic matter, nutrients, and physical properties.

RESULTS TO DATE

Pre-Hugo

The studies from the Santee Fire Plots and elsewhere have shown consistently that summer fires are effective at controlling woody shrubs and favoring herbaceous vegetation. Fire frequency also has an apparent affect, with either annual or biennial fires reducing the number of shrubs. In contrast, the number of hardwood understory stems increases with burning, except for annual summer burns which completely eliminate the hardwoods. The effect of burn periodicity on vegetation is evident when comparing plant types as periodic burning encourages shrubs, while frequent burning encourages grasses and forbs.

Fire releases carbon and nitrogen to the atmosphere, but much of the research has indicated this loss is mitigated by a short-term increase in soil available N and other nutrients immediately after burning, thus stimulating understory vegetative growth and competition. Results from the Santee Fire Plots were used to demonstrate that that neither periodicity nor seasonality adversely affected the soil nutrient pool.

2002 Pilot Study

A recent study indicated that the 40-year fire management regime may be influencing the 2nd rotation productivity. Pine growth is lower on the annual summer treatment; and stocking is reduced on both annual burn treatments. The effects of annual summer fire on understory competition are also evident in the regenerated stand.

PROGRESS & MILESTONES

- The Santee Fire Plots were established in 1946 by researchers for the USFS Southern Research station in Charleston, SC on a 42 year old stand in the Santee Experimental Forest.
- Annual and periodic (3-5 year) burning occurred until 1989.
- Researchers sampled various properties of vegetation and soils at 10, 20, 30 and 40 year treatment intervals.
- Project results provided the basis for numerous publications and served as a cornerstone for prescribed fire research over the past 50 years.
- Hurricane Hugo effectively ended the continuous treatments when it destroyed over 80% of the stand in 1989.
- Plots were cleared, burned, and planted in 1990; no other disturbances have occurred in the stands.
- A study, supported by the Joint Fire Sciences Program, was initiated in 2004 to consider how the 40-year treatment history affects site productivity, nutrient cycling, and the vegetative community.

COLLABORATORS

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